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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/902,727	07/12/2001	Arpan P. Mahorowala	YOR92000064US1	9512

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Burton A. Amernick
Connolly Bove Lodge & Hutz
P.O. Box 19088
Washington, DC 20036-3425

EXAMINER

NOVACEK, CHRISTY L

ART UNIT	PAPER NUMBER
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2822

DATE MAILED: 03/08/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/902,727

Applicant(s)

MAHOROWALA ET AL.

Examiner

Christy L. Novacek

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 January 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-31 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-31 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
- a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- ☐ Interview Summary (PTO-413) Paper No(s). _____.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____.

DETAILED ACTION

This Office Action is in response to the affidavit filed November 24, 2003 and the request for continued examination filed January 23, 2004.

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on November 24, 2003 has been entered.

Response to Declaration

The declaration filed on November 24, 2003 under 37 CFR 1.131 has been considered but is ineffective to overcome the Pike et al. (US 6,420,097) reference.

The evidence submitted is insufficient to establish a conception of the invention prior to the effective date of the Pike reference. While conception is the mental part of the inventive act, it must be capable of proof, such as by demonstrative evidence or by a complete disclosure to another. Conception is more than a vague idea of how to solve a problem. The requisite means themselves and their interaction must also be comprehended. See *Mergenthaler v. Scudder*, 1897 C.D. 724, 81 O.G. 1417 (D.C. Cir. 1897).

The evidence submitted is insufficient to establish a reduction to practice of the invention in this country or a NAFTA or WTO member country prior to the effective date of the Pike reference.

The evidence submitted is insufficient to establish diligence from a date prior to the date of reduction to practice of the Pike reference to either a constructive reduction to practice or an actual reduction to practice.

In relevant part, the MPEP chapter 715.02 states, "The 37 CFR 1.131 affidavit or declaration must establish possession of either the whole invention claimed or something falling within the claim (such as a species of a claimed genus), in the sense that the claim as a whole reads on it." Chapter 715.07 of the MPEP further states, "A general allegation that the invention was completed prior to the date of the reference is not sufficient. *Ex parte Saunders*, 1883 C.D. 23, 23 O.G. 1224 (Comm'r Pat. 1883). Similarly, a declaration by the inventor to the effect that his or her invention was conceived or reduced to practice prior to the reference date, without a statement of facts demonstrating the correctness of this conclusion, is insufficient to satisfy 37 CFR 1.131... The affidavit or declaration and exhibits must clearly explain which facts or data applicant is relying on to show completion of his or her invention prior to the particular date. Vague and general statements in broad terms about what the exhibits describe along with a general assertion that the exhibits describe a reduction to practice 'amounts essentially to mere pleading, unsupported by proof or a showing of facts' and, thus, does not satisfy the requirements of 37 CFR 1.131(b). *In re Borkowski*, 505 F.2d 713, 184 USPQ 29 (CCPA 1974). Applicant must give a clear explanation of the exhibits pointing out exactly what facts are established and relied on by applicant. 505 F.2d at 718-19, 184 USPQ at 33. See also *In re*

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Harry, 333 F.2d 920, 142 USPQ 164 (CCPA 1964) (Affidavit ‘asserts that facts exist but does not tell what they are or when they occurred.’).” In the instant case, the only evidence that Applicant offers to support his declaration is Figure 4 of the originally filed drawings. The only mention of Figure 4 in the specification is in the Brief Description of the Drawings, which recites, “Figure 4 shows the reduction in critical dimension of an isolated line after it was 60% overetched in an O₂ plasma.” Thus, Figure 4 of the drawings is insufficient to show that Applicant had conception of the invention, reduction to practice and/or diligence from a date prior to the date of reduction to practice of the Pike reference to either a constructive reduction to practice or an actual reduction to practice, as the invention is recited in claims 1, 27 and 28. Namely, Figure 4 does not disclose a bilayer resist.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-26 and 31 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1, 3, 7 and 19 recite the limitation of “wherein said underlayer is a tuned polymer”. The term “tuned polymer” has not been disclosed in the specification with adequate clarity and precision to enable one of ordinary skill in the art to determine the metes and bounds of this limitation. As is stated in the MPEP, “If the language of the claim is such that a person of ordinary skill in the art could not interpret the metes and bounds of the claim so as to understand

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how to avoid infringement, a rejection of the claim under 35 U.S.C. 112, second paragraph would be appropriate.” This rejection is discussed further in the *Response to Arguments* section below. Claims 2-26 and 31 are rejected for being dependent upon claim 1.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 1-8, 12, 13, 17, 18, 20 and 22-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pike et al. (US 6,420,097) in view of the admitted prior art.

Regarding claims 1, 3, 20 and 30, Pike discloses producing a lithographically printed image having a reduced critical dimension. This method involves providing a semiconductor substrate (114), providing a tuned polymer underlayer (126) on the substrate wherein the underlayer is free of any element that forms a non-volatile oxide (comprises a BARC of a water soluble fluoropolymer), and providing a photoresist (PR) layer (122) on the underlayer (Fig. 4a-4d; col. 3, ln. 61-col. 4, ln. 42). The PR is exposed to radiation to form an image therein. This image is transferred into the underlayer. A controlled overetch of the underlayer is performed in order to laterally thin the underlayer. The PR layer is formed such that it comprises a material that is etch-resistant in the step of etching the underlayer. Specifically, Pike states that the PR may be silylated (silicon added thereto) in order to improve its etch selectivity to the underlayer (col. 4, ln. 47-48). Pike discloses that an anisotropic etch may be used to etch the underlayer but does not describe a particular type of etching that is to be used (col. 5, ln. 1-3). The admitted prior art states that a reactive ion etch (an anisotropic etching process) using

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oxygen plasma is “well known in the art” (pg. 9, ln. 8-9). At the time of the invention, it would have been obvious to one of ordinary skill in the art to etch the underlayer using an oxygen reactive ion etching process because Pike discloses using an anisotropic process and, in the absence of the disclosure of any particular process, one of ordinary skill in the art would look to use a conventional process such as the oxygen reactive ion etching process disclosed in the admitted prior art.

Regarding claims 2 and 4, Pike discloses that the underlayer may be made of a fluoropolymer (no silicon, boron, phosphorus, germanium or aluminum) (col. 4, ln. 8-11).

Regarding claims 5 and 17, as stated above in reference to claim 1, Pike discloses that the PR may be silylated (silicon added thereto) to improve its etch selectivity to the underlayer (col. 4, ln. 46-48).

Regarding claims 6 and 18, as stated above in reference to claim 1, the admitted prior art discloses that an oxygen reactive ion etching process is conventional in the art.

Regarding claim 7, Pike discloses that the tuned polymer may be AR19, produced by Shipley Corporation, which contains carbon, hydrogen and oxygen.

Regarding claim 8, Pike discloses that the underlayer may comprise an antireflective coating (BARC) (col. 4, ln. 7-11).

Regarding claims 12 and 13, Pike discloses that the radiation used to image the PR layer can be 248-193 nm ultraviolet radiation (UV) (col. 1, ln. 20-28; col. 4, ln. 16-18).

Regarding claims 22-26, Pike discloses overetching the underlayer such that it becomes approximately the width of the desired gate or structure linewidth (col. 4, ln. 23-27). However, Pike does not disclose how the overetching is controlled. The admitted prior art discloses that it

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is well known in the art to control the etch process by using dilution of the oxygen plasma with non-reactive gases such as nitrogen, and also by controlling various process parameters which include RF power, operating pressure, gas flowrate, backside He pressure and electrode and wall temperatures (col. 9, ln. 21-26). At the time of the invention, it would have been obvious to one of ordinary skill in the art to use the methods disclosed by the admitted prior art to control the etch rate of Pike's etching process because Pike discloses controlling the etch process but does not disclose a specific method of doing so, and the admitted prior art discloses that controlling various process parameters is conventional in the art.

Regarding claim 27, Pike discloses a semiconductor substrate, an organic layer (BARC of fluoropolymer) provided on the substrate, and a photoresist layer provided on the organic layer, wherein the photoresist layer has a first image developed therein, and wherein the organic layer has a second image, of reduced critical dimension and congruent with the first image, developed therein.

Regarding claims 28 and 29, Pike discloses providing a substrate, forming a reduced critical dimension bilayer resist image on the substrate, transferring the image into the substrate forming a circuit image, and forming circuit element materials in said circuit image. Pike discloses that the circuit image may be a gate conductive layer or device layer (col. 3, ln. 64-65; col. 4, ln. 23-29).

Response to Arguments

Applicant has submitted no new arguments since the filing of the after-final response filed on November 24, 2003. These arguments were responded to in the Advisory Action mailed

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on December 16, 2003. For the sake of clarity, the response to Applicant's arguments is reprinted below.

Applicant's arguments filed November 24, 2003 have been fully considered but they are not persuasive.

Regarding the rejection of claims 1-26 and 31 under 35 USC 112, second paragraph, applicant argues that the rejection is improper because allegedly, a "person of ordinary skill in the art would understand 'tuned polymer' from the context of the disclosure" (pg. 8 of applicant's response). To support his assertion, applicant states, "Given the disclosure of suitable type of polymer and suitable properties, a skilled artisan would readily be able to select an appropriate polymer for the resist." However, whether or not someone would be able to select an appropriate polymer for the resist based on applicant's disclosure is not the issue which warrants the 112, second paragraph rejection. The term "tuned polymer", because the definition thereof, has not been disclosed in applicant's specification, is deemed so ambiguous that one of ordinary skill in the art would not know if they were infringing upon applicant's claim or not. As is stated in the MPEP, "If the language of the claim is such that a person of ordinary skill in the art could not interpret the metes and bounds of the claim so as to understand how to avoid infringement, a rejection of the claim under 35 U.S.C. 112, second paragraph would be appropriate." Evidence that the term "tuned polymer" is not commonly known in the art is that a search conducted by the Examiner of the database of US Patents and US Patent Application Publications found only 1 other patent and the publication of that patent's application, which used the term "tuned polymer". And in that instance, the term was used to describe a "mechanically tuned polymer grating", thus the term in this patent was used in a way completely

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differently from that of the applicant. Further in support of their argument that a person of ordinary skill in the art would understand the meaning of “tuned polymer”, applicant states, “the concept of a tuned polymer was disclosed in the scientific literature in Lin et al., *A High Resolution 248 nm Bilayer Resist*”. However, nowhere in the Lin et al. reference referred to by applicant does the term “tuned polymer” appear. Thus, the rejections of claims 1-26 and 31 under 35 USC 112, second paragraph are maintained.

Conclusion

All claims are drawn to the same invention claimed in the application prior to the entry of the submission under 37 CFR 1.114 and could have been finally rejected on the grounds and art of record in the next Office action if they had been entered in the application prior to entry under 37 CFR 1.114. Accordingly, THIS ACTION IS MADE FINAL even though it is a first action after the filing of a request for continued examination and the submission under 37 CFR 1.114. See MPEP § 706.07(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however,

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will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christy L. Novacek whose telephone number is (571) 272-1839. The examiner can normally be reached on Monday-Thursday and alternate Fridays 7:30 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on (571) 272-1852. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

CLN
March 1, 2004


AMIR ZARABIAN
SUPERVISORY PATENT EXAMINER
MARCH 01 2004 09:57:23